It is then shown that the effects of inertia, which had been neglected in finding the laws of the tidal movements, cannot be such as to materially affect the accuracy of the results.

In the first part of this paper I followed Sir W. Thomson in using the equilibrium theory for the determination of the amount of reduction of ocean tides. But that theory is acknowledged on all hands to be very faulty in its explanation of tides of short period; hence a dynamical investigation of the effects of a bodily yielding of the earth on a tide of short period in a shallow equatorial canal appeared likely to be interesting. This investigation is carried out in the second part of the paper. The problem is simplified by supposing the circular canal developed into a straight canal, whose bottom is constrained to execute a simple harmonic wave motion.

The result shows that the height of the ocean tide relatively to the nucleus bears the same relation to the height of tide on a rigid nucleus as in the equilibrium theory, and that the alteration of phase is the same. This seems to increase the force of Sir W. Thomson's argument as to the rigidity of the earth.

The chief practical result of this paper may be summed up by saying, that it is strongly confirmatory of the view that the earth has a very great effective rigidity; but its chief value is, that it forms a necessary first chapter to the investigation of the precession of viscous and imperfectly elastic spheroids—an investigation which I hope to complete very shortly.

VI. "On the Formation of Chlor-iodide and Brom-iodide of Ethylidene." By Dr. Maxwell Simpson, F.R.S., Professor of Chemistry, Queen's College, Cork. Received May 7, 1878.

(Preliminary Notice.)

Chlor-iodide of ethylidene $\begin{matrix} CH_3 \\ | \\ CHClI \end{matrix}$. This body I have succeeded in preparing by two processes.

First Process.—A quantity of iodide of ethylidene, which had been prepared by Gustavson's method, and heated to 160° C. but not distilled, was vigorously agitated for some time with a weak solution of chloride of iodine without the application of heat. The excess of chloride was then poured off, and the product well washed with dilute potash and distilled. Almost the entire quantity passed over between 110 and 150° C. This yielded, on fractioning, a large quantity of fluid boiling between 116 and 120° C., most between 117 and 119.° This was the body in question. The chloride of iodine used in this process was

prepared by passing washed chlorine into 4 oz. of water, holding 400 grains of iodine in suspension, till *almost* all the iodine was dissolved. The vessel containing the iodine must be surrounded with cold water, and repeatedly shaken during the passage of the gas.

This method is quite analogous to that by which I obtained its isomer, the chlorio-dide of ethylene.*

Second Process.—One molecule of iodide of aluminium (Al_2I_6) was dissolved in three times its weight of dry carbon disulphide, and added drop by drop without exposure to air to six molecules of chloride of ethylidene ($C_2H_4Cl_2$) diluted with an equal volume of the disulphide. The chloride of ethylidene must be surrounded with ice, and kept in a state of continual agitation during the addition of the aluminium iodide solution. By mixing the reacting bodies in this way, the chloride is always in excess, and only one atom of chlorine in each molecule is supplanted by one of iodine. After the addition of the aluminium iodide, the product was filtered through asbestos, washed with water, and heated in a water-bath to drive off the carbon disulphide.† The residue, which had been previously washed with dilute potash, on being heated above 100°, commenced to distil at 110°, and between that temperature and 155° C. about two-thirds of it passed over. (The liquid distilling above 155° was iodide of ethylidene). This yielded, on fractioning, a large quantity of an oil boiling at the same temperature, and having the same properties as that prepared by the first process. On submitting this body to analysis I obtained the following numbers:

	Theory C_2H_4ClI.	Experiment.
Carbon.....	12·60	12·92
Hydrogen.....	2·10	2·23

Chlor-iodide of ethylidene has a sweet taste, and is almost colourless when freshly prepared. Its specific gravity at 19° C. is = 2·054. It distils without decomposition between 117 and 119° C. It will be observed that its boiling point is 20 degrees lower than that of its isomer, the chlor-iodide of ethylene (137° C.), and is intermediate between those of the iodide (177° C.) and chloride of ethylidene (58° C.).

Of these processes, the second is easier of execution and yields a larger product.

Brom-iodide of ethylidene $\begin{matrix} CH_3 \\ | \\ CHBrI \end{matrix}$. This body I obtained also from the iodide of ethylidene, and by a process almost identical with the

* Proc. Roy. Soc., xi, 590.

† It is advisable to use Würtz's tube with two bulbs in distilling the carbon disulphide, as a large quantity of the chlor-iodide passes over with the disulphide when the distillation is conducted in the usual way.

first used for the preparation of chlor-iodide of ethylidene. The iodide was agitated in the cold for some time with a weak solution of bromide of iodine,* the excess of bromide was separated, and the product was washed with dilute potash. On subjecting this to distillation almost the entire quantity passed over between 130 and 165° C. On fractioning I obtained a large quantity of fluid distilling between 140 and 148°, most between 142 and 144°. The following equation explains the formation of this compound:

$$\begin{matrix} CH_3 \\ | \\ CHI_2 \end{matrix} + BrI = \begin{matrix} CH_3 \\ | \\ CHBrI \end{matrix} + II.$$

On analysing this body I obtained the following results:

	Theory C_2H_4BrI.	Experiment.
Carbon	10·21	10·24
Hydrogen	1·70	1·82

Brom-iodide of ethylidene is nearly colourless when freshly prepared. It has a sweet taste, and distils without decomposition between 142 and 144° C. This is about 20 degrees lower than the boiling point of its isomer, the brom-iodide of ethylene (163° C.). It refuses to become solid even when surrounded with a mixture of ice and salt, differing in this respect also from its isomer. Heated with alcoholic potash it yielded a volatile vapour containing bromine, probably bromide of vinyl, and iodide of potassium.

This body is probably identical with those obtained by Pfaundler† and by Reboul‡ by exposing bromide of vinyl to the action of hydriodic acid. The boiling points of their compounds agree pretty well with each other and also with mine.

I am at present engaged in studyiug the behaviour of these compounds towards several reagents.

I have to thank my young pupil, Mr. Harrington, for his valuable assistance during the progress of this research.

VII. "Note on the Specific Gravity of the Vapours of the Chlorides of Thallium and Lead." By Henry E. Roscoe, F.R.S., Professor of Chemistry in Owens College, Manchester. Received May 8, 1878.

Experimental difficulties of so serious a nature surround the attempt

* For the preparation of the bromide of iodine, see Proc. Roy. Soc., No. 149, 1874. It was made a little weaker for this process.

† "Jahresbericht," 1865, p. 483.

‡ *Ibid.*, 1870, p. 439.